

hemisphere, it being understood that telegrams have been sent to the Cape and to Australia (by Lord Crawford) with this object. According to the above orbit, on July 9 the comet will have one-fifth of the intensity of light on the night of discovery. There is no close resemblance of elements to those of any comet previously calculated.

THE "ASTRONOMISCHE NACHRICHTEN."—It is announced that after the termination of the current volume, by authority of the Prussian Government a new arrangement for the management of this journal will take effect. It will be edited by Prof. A. Krueger, the director of the Observatory at Kiel, in co-operation with the president of the "Astronomische Gesellschaft," of which association it will become a recognised organ.

BIOLOGICAL NOTES

LIMULUS POLYPHEMUS.—A paper on the anatomy, histology, and embryology of *Limulus polyphemus*, by A. S. Packard, jun., M.D. (*Anniversary Mem.* Boston Soc. Nat. Hist. 1880), may be regarded as a continuation of the author's former series on the development and affinities of the king-crab. He discusses fully the question of the affinities of that puzzling animal, and combating the position of those zoologists who connect *Limulus* with the Arachnida, he sums up the facts which point to the crustacean nature of *Limulus* as follows:—(1) The nature of the branchiæ, those of *Limulus* being developed in numerous plates overlapping each other on the second abdominal limbs (those of the Eutryperida being, according to H. Woodward, attached side by side like the teeth of a rake), while the mode of respiration is truly crustacean; (2) the resemblance of the cephalothorax of *Limulus* to that of *Apus*; (3) the general resemblance of the gnathopods to the feet of Nauplius or larva of the cirrhipedia and copepoda; (4) the digestive tract is homologous throughout with that of Crustacea, particularly the Decapoda, there being no urinary tubes as in Tracheata; (5) the heart is on the crustacean type as much as on the tracheate type, and the internal reproductive organs (ovaries and testes) open externally, at the base of and in the limbs, much as in Crustacea. The paper is illustrated by seven plates showing the circulation of *Limulus*, sections of the adult and of embryos, and details of the structure of the eyes with comparison of these with those of Trilobites, with which group the author, as in his first memoir, allies the Merostomata.

THE NUMMULITIC ECHINIDS OF EGYPT.—A monograph of the Echinids contained in the Nummulitic strata of Egypt, by M. P. de Lorient, is published in the *Mem. Soc. Phys. et d'Hist. Nat. de Genève* (tom. xxvii. 1880, 1^{re} p.). The specimens described by M. de Lorient were obtained mostly near Cairo and Thebes. The fauna of the Nummulitic strata of Egypt has been found by him as far as yet explored to contain forty-two species of Echinids, or about the same number as that of the Nummulitic strata of India; that of the Canton of Schwytz has only thirty-four, the Eocene fauna of the Antilles only eighteen; but the Eocene fauna of the Pyrenees has as many as ninety-three. In the present memoir, which is illustrated by ten plates, twenty new species are described. The author does not concur in Prof. Jeffrey Bell's reasons for the formation of his new genus *Paleolampas*, considering that there are not sufficient grounds for separating it from *Echinolampas*. Only four of the forty-two species composing the Egyptian Nummulitic fauna are regular Echinids, all the rest are irregular. Of the whole number all but eight are peculiar to Egypt. Of the eight exceptions four occur in the lower part of the Nummulitic formation at San Giovanni Harione, in the Vicentin, three in that of the Pyrenees, whilst the remaining one, *Hemispatanzus depressus*, has been found in the Crimea in the same beds as *Echinolampas subcylindricus*, which also occurs at San Giovanni Harione.

SPONGES OF LAKE BAIKAL.—In a recent note to the St. Petersburg Academy, Dr. Dybowski says sponges occur in Lake Baikal wherever the bottom is rocky or large blocks of stone or wood are lying about. Close to the border of the lake, at a depth of 2 to 6 metres, they have a sod or cushion-like form, clinging to the stones, blocks, and (more largely) to decaying wood. In a depth of 6 to 25 metres they become tree- or shrub-like, with a height rarely exceeding 60 cm.; while from 25 to 100 m. depth the sod or cushion-like form recurs; and only that is met with. The colour of the sponges is generally more or less dark grass-green, sometimes olive-green or brown. But

those got from depths of 60 to 100 m., or found under stones, are nearly quite white.

MICROSCOPICAL EXAMINATION OF FARINA.—In examining any given kind of farina with the microscope to find whether a less nutritive farina has been mixed with it, it has been common to confine attention to the starch granules (which one may easily be mistaken about): Dr. Cattaneo holds (*Re. Ist. Lomb. Rend.* vol. xiv. fasc. v.) that greater importance should be attached to the character of the bran-particles, some of which are never wanting even in the most carefully-bolted flour. These (as he shows) differ in a marked way according to species.

THE HYPOPHYSIS IN ASCIDIANS.—While the hypophysis, or pituitary gland, found in the cranial cavity of adult vertebrates seems to be a rudimentary body without function, it is, in its earlier development, furnished, like all active glands, with an excretory passage into the alimentary canal. On the instance of M. van Beneden, M. Julin has lately studied an enigmatical organ in ascidians, a glandular apparatus under the brain (discovered by Hankow), which, it was thought, might be homologous with the pituitary gland of vertebrates. M. Julin examined the gland, the so-called anterior tubercle or vibratile organ, and various connected organs, in four species of ascidians at Leewik, on the Norwegian coast, and his researches (lately described to the Belgian Academy) appear to confirm M. van Beneden's conjecture. M. Julin is unable to regard the vibratile organ as an olfactory organ (the ordinary view); it receives no nerve-branch, and no olfactory cells can be found in its vibratile cylindrical epithelium. It is (he considers) merely the enlarged mouth of the excretory canal of the gland below the brain, leading into the buccal region, while the gland itself represents, in permanent state and functional activity, the embryonic hypophysis which becomes rudimentary in vertebrates. The rôle of the gland remains in obscurity. (Anatomical details will be found in the Academy's *Bulletin*, No. 2.)

PHYSICAL NOTES

AN extremely ingenious explanation of the peculiar green phosphorescence observed by Crookes in his researches on high vacua has recently been given by Mr. J. J. Thomson of Cambridge. This phosphorescence appears on the inner surfaces of the exhausted glass tubes whenever they are exposed to the so-called molecular bombardment of particles projected from the negative electrode. Mr. Thomson points out firstly that, as predicted by Clerk-Maxwell and verified by Rowland, a moving electrified particle acts as a current of electricity and possesses an (electro-magnetic) vector-potential. Now where such an electrified particle strikes a glass surface and rebounds, its change of velocity is accompanied by a change of vector-potential, and the glass against which it impinges and rebounds will be subjected to a rapid change in electromotive force. But by Clerk-Maxwell's electro-magnetic theory of light this is precisely what happens when a ray of light falls upon it. And therefore it phosphoresces as it would under the impact of an actual ray of light. It would be interesting to inquire whether all phosphorescent and fluorescent phenomena are capable of an analogous explanation in accordance with Clerk-Maxwell's theory.

MR. E. H. COOK proposes (*Phil. Mag.*) the term *sonorescence* as suitable to apply to the phenomena discovered by Graham Bell and investigated by Mercadier, Tyndall, and others, of the direct conversion of intermittent radiations into sound. The new name is obviously suggested by analogy with fluorescence and calorescence, but does not seem quite a happy one. Stokes gave the name of *fluorescence* to the phenomenon of the change of non-luminous ultra-violet rays into luminous ones. Akin gave the name of *calorescence* to the phenomenon of the change of non-luminous heat-rays into luminous ones (as in the lime-light), but the term has been superseded by Tyndall's term *calorescence*, which is etymologically unfortunate, seeing that the Latin verb is *calesco*, not *caloresco*. By strict analogy the term *sonorescence* should mean the conversion of sound into luminous rays, not the reverse change, to which Mr. Cook applies it.

THE researches of Edlund, Joubert, and others have left no doubt that the voltaic arc possesses an electromotive force of its own acting in a direction opposite to that of the current which sustains the arc. The principal work of maintaining the arc appears indeed to be spent in overcoming this opposing force, and is not occasioned by the resistance of the arc itself, which is small. M. Alfred Niaudet has lately announced the observation